ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1911.

XLIII.—A NEW PAINT-DESTROYING FUNGUS.

(*Phoma pigmentivora*, Mass.)

(With Plate.)

G. Massee.

It is proverbial that certain kinds of fungi flourish on the most varied substances, acid and alkaline solutions respectively in some instances forming a suitable matrix. Writing-ink frequently becomes clogged with the mycelium of the common blue mould *Penicillium glaucum*; the same fungus also invades eggs, the mycelium penetrating to the interior through the porous texture of the shell. In the laboratory water solutions of stains, more especially eosin, are frequently rendered useless owing to a dense growth of mycelium; dilute solutions of acetic acid and of glycerine are also invaded. As a rule, when fungi develop under such exceptional conditions they remain sterile, the mycelium or vegetative portion of the fungus alone developing, and often presenting many remarkable departures from the normal type of structure.

Amongst the most remarkable of such fungi is one that elects to grow on fresh paint. It flourishes in the greatest profusion in hothouses, its development being apparently favoured by a high temperature and constant humidity, as it is but rarely observed on paint elsewhere. About a month or two after a hothouse has been painted, more especially if white paint has been used, numerous small pale rose-coloured specks appear on the paint; these specks gradually increase in size, and change to a purple, or sometimes dark red colour, suggesting the idea of blood having been sprinkled over the paint. In course of time the discoloured areas extend considerably, and form broadly effused patches several inches across. About a week after the coloured patches are fully developed, their surface becomes studded with minute blackish-red warts. Each wart is a fungus fruit, containing myriads of very minute spores, which in due course are dispersed and start new points of infection.

When the fungus appears in abundance, as is usually the case, the paint is irretrievably ruined, and serious loss follows. During

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the present year one firm of painters lost over £200 in consequence of the appearance of the fungus in a large number of cucumber-houses painted with expensive protective paint. All the work had to be done over again, and in some instances the second coat had to be removed and a third coat applied.

The surface of the paint is not at all broken up, or in any way injured by the fungus, and the amount of discoloration depends on the relative quantity and spread of the mycelium.

When the spores of the fungus are sown on a streak of wet white paint, a faint roseate tint appears in about a week's time, and within three weeks fruit is produced in abundance, and the deep purple characteristic blotches are well developed.

Spores sown on a thin smear of pure linseed oil germinate as readily as in paint, but the mycelium remains colourless, and, so far, no fruit has been produced. The result is the same when the spores germinate in ordinary nutritive media or in water.

No germination takes place when the spores are sown on a streak of pure white lead, or carbonate of lead. Hence this substance alone is not a suitable medium for the growth of the fungus, although its presence is necessary to enable the plant to complete its normal course of development, and it is also the constituent from which the fungus produces as a by-product the purple-red colouring matter, which is collected in oily-looking drops within the cells of the mycelium, the cell-walls themselves remaining colourless. The red colour suggests that the white carbonate of lead undergoes some chemical change induced by the presence of the fungus, resulting in the formation of red oxide of lead. This matter, however, requires careful investigation.

The presence of two per cent. of carbolic acid in paint completely arrests the development of the fungus.

Hydrogen peroxide bleaches, or at all events considerably reduces the red colour without injuring the paint, but this is not a practicable remedy on an extensive scale.

The following is a technical description of the fungus :—

Phoma pigmentivora, *Massee*. *Maculae* suborbiculares, determinatae, laete rosaceae vel rosaceo-purpureae, 1–8 cm. diametro. *Perithecia* in maculis laxe gregaria vel confertiuscula, vix prominula, purpureoatra, subglobosa, contextu parenchymatico, ostiolo vix papillato donata, 125–150μ diametro. *Sporulae* ellipsoideae, hyalinae, 4–6 × 2–2·5μ.

Explanation of Plate.

Figs. 1 and 2 showing discoloured patches produced by the fungus. Nat. size.

Fig. 3. Patches of the fungus three weeks after the spores were sown on a thin film of wet paint. Nat. size.

Fig. 4. Perithecium of fungus. Highly magnified.

Fig. 5. Mouth or opening of a perithecium. Highly magnified.

Fig. 6. Spores of fungus. Highly magnified.

XLIV.—GARDEN NOTES ON NEW TREES AND SHRUBS.

(With Plate.)

W. J. Bean.

VIII.—*New Chinese Species.*

Berberis verruculosa, *Hemsley and Wilson* [Berberidaceae].

Among the numerous species and forms of *Berberis* which recent exploration in China has added to our collections, none is more distinct and in habit at least more pleasing than this. It is an evergreen bush of low, sturdy, very neat habit, probably never much more than two feet high. One of the most distinctive characters of the plant is the roughness of the young stems due to a dense covering of small, dark, warty excrescences. Leaves densely arranged in fascicles along the branch, elliptic-oblong, ½ to 1½ inches long; spine-tipped and spiny-toothed, coriaceous, dark shining green above, glaucous beneath, margins revolute. Flowers golden-yellow, short-stalked, solitary or in few-flowered fascicles. Fruit black covered with a blue bloom. The species was discovered in Western China and introduced by Wilson in 1904. Four years later it flowered with Messrs Veitch at Coombe Wood, and to them Kew is indebted for a healthy plant lately added to the collection.

Carpinus polyneura, *Franchet* [Betulaceae].

This beautiful hornbeam is only represented in cultivation by a single tree at Kew, growing at the north entrance of the Rhododendron Dell and now about 16 feet high. It was raised from seed sent by Mr. A. Henry, in 1889, from Central China. It is a small tree 30 feet high with slender branches pendulous at the ends which give the tree a very elegant aspect. Leaves ovate, acute, slightly cordate at the base, 1 to 2½ inches long, ½ to 1 inch wide, sharply (occasionally doubly) dentate, dark shining green and glabrescent above and with silky down on the midrib and veins beneath. The leaves differ from those of other hornbeams in cultivation in being flat and scarcely plicate. In its leafless state the tree is distinguished by the narrow, linear, silky stipules which persist through the winter and until the appearance of the new leaves. The tree at Kew flowers regularly and has borne clusters of fruit but the seed formed has hitherto been infertile.

Corylus Colurna var. **chinensis**, *Burkill in Journ. Linn. Soc.* xxvi., 503 [Cupuliferae].

Few deciduous trees are more handsome in leaf and habit or more interesting in fruit than the "Constantinople Nut"—*Corylus Colurna*. It reaches 70 to 80 feet high in continental gardens and is the only species of *Corylus* hitherto in cultivation which makes a genuine tree. A new arborescent variety, however, has recently been introduced from Central China, viz., the var. *chinensis* of Burkill. Originally discovered by Henry, in Szechuan in 1888, nuts were first sent home by Wilson in 1901 from which a number of young trees were raised by Messrs. Veitch at Coombe Wood, and thence obtained for Kew. Mr. Wilson informs me that this tree is usually met with 50 to 60 feet high, but that he has seen it over

100 feet high—a magnificent size for one of the hazels. The leaves are ovate-oblong or obovate, as much as 6½ inches long by 4 inches wide, deeply and obliquely cordate at the base, acuminate, rather finely and unequally dentate; pilose on the midrib and with scattered bristles above; glandular-pubescent on the midrib and veins beneath. The young branchlets and petioles are also glandular-pubescent. Our young plants have not borne flowers as yet, but they give promise of being quick growers and perfectly hardy.

Fokienia Hodginsii, *Henry and Thomas* [Coniferae].

Mr. H. Clinton Baker of Bayfordbury has recently presented to Kew a plant of this new and extremely rare conifer. It is one of a few living specimens sent to him in 1909 by his brother Capt. L. Clinton Baker, R.N., from the Fokien province of Eastern China. The species has been made the type of a new genus of *Coniferae* by Henry and Thomas. It is described by the authors as in many respects intermediate between *Cupressus* and *Libocedrus*, the cones being similar to those of the cypresses belonging to the Chamaecyparis group, the foliage resembling in many points that of *Libocedrus macrolepis*. It is described as a tree 40 feet high. On Mr. Clinton Baker's plant—a young one about four feet high—the flattened, sharply pointed leaves are ¼ to ⅓ inch long, deep lustrous green above with conspicuous white bands of stomata beneath. The leaves are in flattened whorls of four, the outer pair twice as large as the inner are. Mr. Clinton Baker thinks that it will not withstand our winters but in any case it will make a handsome evergreen for conservatories and winter gardens and may prove suitable for the south-western counties in the open.

Pinus Bungeana, *Zucc.* [Coniferae].

The lace-bark pine of China is one of the most remarkable and attractive of its kind. It is still amongst the rarest of pines in gardens, but is represented at Kew by a number of well-grown examples. These have produced cones in recent years and the species has been figured in the *Botanical Magazine* t. 8240. No cultivated specimen appears yet to have developed the white bark which is the most remarkable characteristic of this pine and which is well illustrated in the accompanying plate of trees growing in the environs of Peking. The Kew trees shed their bark freely after the fashion of a plane, but the newer bark revealed is dark brown and not white. The accompanying extract from an interesting letter of Sir Ernest Satow's would seem to show that this is probably due to the comparative juvenility of our trees:—

"Here is a photograph of three specimens of *Pinus Bungeana* standing about three miles west of Peking. The structure on the left of the centre tree is an old tomb, and the height of the masonry as far as my recollection goes is about 8 feet, which affords a standard for measuring the height of the trunk up to the point where the branches begin. The tomb is quite old, and neglected, so that possibly it is more than a century old. There are a great many of these trees in and near Peking, either in the grounds of palaces or planted in private graveyards of wealthy families. I

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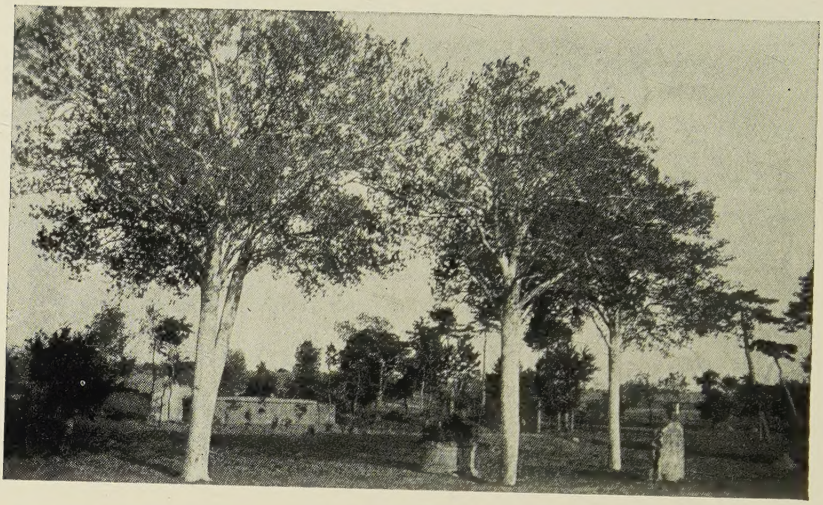

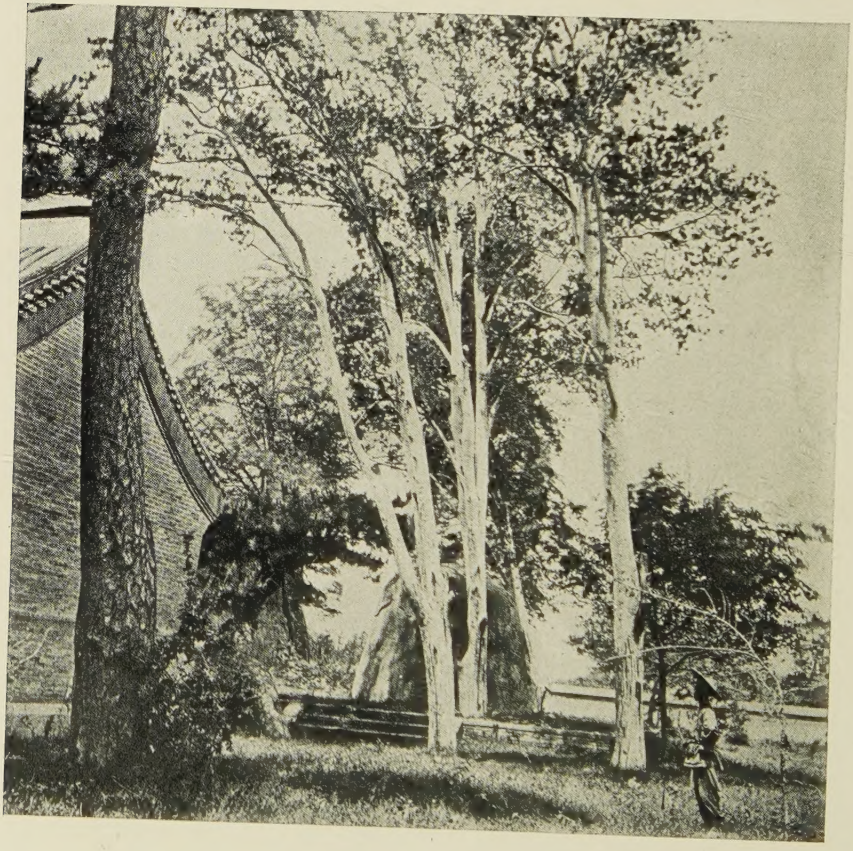

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never saw one that seemed self-sown. I find a note made in 1904 that sometimes the trunk divides a few feet from the ground, and the stems grow up straight side by side. In other cases it reaches a height of at least 20 feet without dividing, and then branches out forming almost a spherical head. The younger trees have a greenish reddish bark, which in older specimens looks quite white when seen from a distance. The peasants scratch the bark with a knife in order to procure the resin.

"When I planted one in the grounds of the Legation I was told by the Chinese florist from whom I bought it that these trees do not exhibit a white bark till they are about fifty years old."

Explanation of Plate.

The upper photograph represents the three trees of *Pinus Bungeana* growing near Peking described in Sir Ernest Satow's letter.

In the lower photograph three other white-barked trees of this species are shown and on the left is seen the trunk of another species of *Pinus*. The specimens of *Pinus Bungeana* differ from those in the upper figure in their less compact habit. The trunks in two of the specimens have forked near the ground. This photograph was also taken near Peking.

Sarcococca humilis, *Stapf* [Euphorbiaceae-Buxeae].

Species nova a *S. Hookeriana*, Baill., differt statura humili, foliis minoribus et pro ratione latioribus, costa inter sulcas supra magis prominente, bracteis obtusis minute apiculatis latius hyalino-marginatis, filamentis brevius e periantho exsertis.

Fxutex humilis, ramulis novellis tenuiter pubescentibus diu viridibus. *Folia* lanceolata vel nonnulla subovato-lanceolata, utrinque acuta, 3–7 cm. longa, 1–1·8 cm. lata, laete viridia, subcoriacea, praeter costam supra inter sulcas distincte prominentem basin versus papilloso-pruinosam glaberrima, in petiolum 4–6 mm. longum sensim decurrentia. *Florum* glomeruli circiter 6-(rarius pluriflori), ante anthesin saepe nutantes; bracteae ovatae, acutae. *Perianthii* ♂ sepala 4, late ovata vel interiora late elliptica, obtusa, saepe minute apiculata, minutissime ciliolata, 3·5–4 mm. longa. *Stamina* 4, filamentis 6 mm. longis, antheris primo purpureis denique flavis minute apiculatis, 0·5 mm. longis. *Perianthii* ♀ sepala 4 vel 6, ovata, acuta, angustiora quam in ♂, minutissime ciliata, 2 mm. longa; stigmata 2 vel 3. *Fructus* baccatus, globosus, niger, 7–8 mm. diametro.

China. Hupeh: Changyang, *Henry*, 7834; Szechuan, *Henry*, 7065. Western China, without precise locality, *Wilson* (cult. by J. Veitch & Sons from seeds, collected by Wilson, 1907).

An evergreen shrub 1 to 1½ feet high, of neat tufted habit, sending up new stems from the ground like the butcher's broom, the young stems covered with a minute pubescence. Leaves alternate or sub-opposite, lanceolate or ovate-lanceolate, pointed at both ends, 1 to 3 inches long, ⅓ to ¾ inch wide, glabrous, leathery, dark lustrous green, with a prominent marginal nerve; petiole ⅛ to ¼ inch

long. Flowers white, very fragrant, produced during early spring in short racemes from the axils of the terminal leaves. Fruit a roundish black berry, ¼ inch in diameter.

Although this little evergreen is not in any way showy, its dainty habit and fragrant flowers will make it suitable for a shady corner of the Rock Garden. It is a native of Western China and was introduced by Wilson in 1907 for Messrs. Veitch, from whom the plant at Kew has been obtained.

IX. *Two Japanese Trees.*

Fagus japonica, *Maximowicz* [Cupuliferae].

Very little is known of this beech in Britain. Professor Sargent sent a plant to Kew in 1907 and this, so far as I am aware, represents its first appearance in this country. Last year the Japanese authorities of the Shepherd's Bush Exhibition brought over a few specimens from Japan, one of which they presented to Kew. It is a small deciduous tree, often a mere bush, the young branchlets covered with silky hairs. Leaves oval or ovate, sometimes cuneate at both ends and rhomboidal; 2 to 2½ inches long, 1 to 1½ inches wide; silky when young like the branchlets, but glabrous by autumn. The most distinctive character of the species is the comparative shortness of the involucre of the nut. The nut is triangular as in the common beech and ½ inch long but it is little more than half enclosed by the involucre. Involucre 4-lobed, covered with short stiff spines. How little is known of this beech may be inferred from the fact that there is only one specimen in the Kew Herbarium, which was collected in the Hakone mountains of Japan by Tschonoski.

Magnolia salicifolia, *Maximowicz* [Magnoliaceae].

In a genus of such distinction and garden value as *Magnolia*, the addition of a new species to those already in cultivation is a matter of considerable interest to planters. *M. salicifolia*, which flowered at Kew in April last for the first time, is a native of Japan, and was introduced in 1904. According to Professor Sargent (Forest Flora of Japan, p. 10), it is very common on Mt. Hakkoda and is there a slender tree 15 to 20 feet high with a trunk about 1 foot in girth. In our cultivated specimens the leaves are oval to lanceolate, 2 to 4 inches long, ⅝ to 1¼ inches wide, dark green and glabrous above, glaucous and covered beneath with a fine pubescence. The flower has six pure white petals, the inner three 2 inches long, ½ inch wide, oblong, acute; the outer three are scarcely so long, slightly obovate, ⅝ inch wide. Peduncle, winter leaf-buds and branchlets perfectly glabrous. Seeds, according to Shirasawa, scarlet. It is curious that a tree so plentiful in its own habitat should be so little known. Professor Sargent remarked in 1894 (*loc. cit.*) that the flowers were unknown to botanists, and there are none in the Kew Herbarium. A flowering twig has, however, since been figured by Shirasawa, Iconog. Essences Forest. Japon, vol. i, t. 40. The species is evidently closely allied to *M. Kobus*, but besides differences in foliage, the leaf buds of *M. Kobus* are pubescent and the peduncle silky.

X. *A Himalayan Cherry.*

Prunus rufa, *Wallich* [Rosaceae].

This interesting cherry was raised from seed sent to Kew from the Calcutta Botanic Garden in 1897 and has so far proved perfectly hardy. During the last few years it has flowered freely. It is a deciduous tree said to be 15 to 20 feet high, the young branchlets covered with a dense, rusty-coloured pubescence. Leaves 2 to 4 inches long, narrowly elliptical or oblong-lanceolate with an acuminate apex, conspicuously glandular-dentate, the upper surface glabrous, the lower one hairy when young only on the midrib and nerves. Flowers pink, $\frac{1}{2}$ inch diameter, produced during May singly or in pairs from axillary buds of the previous year's growth. Calyx funnel-shaped, $\frac{1}{3}$ inch long with five triangular dentate lobes. There are two forms of this cherry at present in cultivation at Kew, the one with a glabrous calyx and close bark, the other with a hirsute calyx and conspicuously peeling bark. Whether these characters are always correlated or not, I have not had an opportunity of ascertaining.

This cherry is a native of Nepal and Sikkim at elevations of 12,000 feet and although not one of the most showy is pretty and distinct on account of the rufous down, and the conspicuously glandular teeth of the leaves.

XI. *A Monotypic American Tree.*

Leitneria floridana, *Chapman* [Leitneriaceae].

While this shrub or small tree is not likely to add much to the ornamentation of gardens it is undoubtedly one of the most interesting plants of North America. In itself it constitutes the Natural Order *Leitneriaceae*, which Bentham and Hooker place between *Platanaceae* and *Juglandaceae*. An undated specimen in the Kew Herbarium was collected, according to a note in Sir Wm. Hooker's handwriting, by Drummond on the "Rio Brazos, Texas." This represents the earliest discovery of the species (probably in 1835), but there is much doubt of its having been collected in the place named; it has at any rate never since been found there. It was found again in 1847 by Dr. Chapman near the town of Apalachicola in Florida. Finally in 1892, it was found in a new station by Mr. B. F. Bush in S.E. Missouri. Wherever it has been seen wild it inhabits swampy spots, often with its roots submerged.

The *Leitneria* is a shrub or small tree usually 5 to 10 sometimes 20 feet high, with a main stem 3 to 5 inches thick at the base, the young branchlets hairy. The leaves are narrowly oval, tapered about equally at both ends, 3 to 7 inches long, $1\frac{1}{2}$ to 3 inches wide, thinly hairy above, clothed with brown felt beneath. The plants are unisexual, the male flowers borne on the naked wood, in stout, axillary, erect catkins $1\frac{1}{2}$ inches long and consisting of stamens only enclosed in a hirsute scale. The female flowers are in shorter, more slender catkins. Fruit a dry drupe, compressed, oval, $\frac{3}{4}$ inch long, $\frac{1}{4}$ inch wide. The wood is, perhaps, the lightest known, having little more than one-fifth the specific gravity of

water. The species has recently been obtained for Kew from the New York and Missouri Botanic Gardens and from the Arnold Arboretum.

The behaviour of the *Leitneria* in cultivation can as yet be only surmised, but last year I saw it thriving in the Arnold Arboretum and in Highlands Park, Rochester, N.Y. In the former place it was planted in peaty soil, and occupied a low moist position, but at Rochester it was in an ordinary position on a sunny slope planted in a bed of Azaleas and other peat lovers. It was also thriving well in ordinary soil in the New York Botanic Garden. All these places have much colder winters than ours but the summer heat is greater. According to Professor Trelease who gives a full and interesting account of this remarkable tree in the *Sixth Report of the Missouri Botanical Garden*, it grows in rich swampy soil which never becomes dry and where there is usually 6 inches or more of water. But experience shows that it is inadvisable to attempt to imitate nature too closely in such respects. Many water-loving trees of North America thrive quite well here in ordinary soil. This shrub will be most likely, I think, to succeed in the sunniest position we can give it, planted in a peaty soil never allowed to become dry.

XLV.—REPORT ON INVESTIGATIONS MADE REGARDING "BEECH COCCUS."

(*Cryptococcus fagi*, Bärensprung).

L. A. Boodle and W. Dallimore.

Introduction.

During the last fifteen years some concern has been felt by owners of estates in various parts of the country on account of the increase of the insect pest, known familiarly as "Beech Coccus" or "Beech Louse," and scientifically as *Cryptococcus fagi*. In many quarters the insect is credited with causing the death of those trees which it attacks, and opinions have been expressed that it will eventually increase so as to cause an epidemic, which will devastate whole plantations. On the other hand, there are those who have taken a less pessimistic view of the disease, and are sceptical as to whether the amount of injury attributed to the insect is really caused by it.

In view of these conflicting opinions, we were instructed by the Director of the Royal Botanic Gardens, Kew, to investigate the matter in order to ascertain, if possible, the precise action of the Coccus on the Beech, and to obtain an idea of the damage it is actually doing or is likely to do. With that object before us visits were paid to numerous beech-woods in the Chiltern district, and attention has been given to the disease under various conditions in different parts of the country.

Description.

The appearance of an infested tree is well known to people who are interested in arboriculture or sylviculture, for the white, cottony covering with which the insect protects itself is very conspicuous. It is usually most abundant on the undersides of the branches and in cracks and depressions in the bark; but occasionally it may appear in large patches covering a considerable part of the trunk.

The insect itself is less familiar, for it is very small, and though visible to the naked eye, a lens or microscope is required to study it satisfactorily.

The mature insect has a rounded form and yellow colour, and a sucking-tube composed of three parts. This tube is attached to the lower side of the insect and is inserted in the bark so as to act as an anchor and feeding-tube. The body bears a number of fine threads of a waxy substance, which form a wool-like covering and completely hide the insect. In the young stage, the insect has six legs, and may be seen in an active condition in early autumn. It settles down in a short time, loses its legs, and becomes permanently attached to the bark by its sucking-tube.

References.

That the disease is not a new one is evident, for occasional references have been made to it for more than half a century. The earliest record we have found occurs in the "Gardeners' Chronicle" for January 30th, 1858, p. 71. In this reference to the disease (in an editorial reply to a correspondent), the insect is called *Psylla fagi*, and it is stated that it is understood not to injure the beech, though it infests it largely. In the issue of the same journal for Jan. 7th, 1860, p. 8, the coccus is again referred to, though under the name of *Psilonia nivea*, Fries., [Beech-bark Fungus]. It is described as being not common, but occurring in great abundance if at all.

The following article by Mr. R. G. Foggo in vol. vii of the "Edinburgh Botanical Society's Transactions" 1863, p. 334, serves to show that the Coccus-disease was prevalent at that date, that its distribution was probably similar to what it is at the present day, and that during the half-century which has elapsed, little knowledge has been gained of the actual relation between the growth of the Coccus and the health of the trees.

"For two or three years preceding 1858 my attention was directed to a disease which had proved fatal to some very fine specimens of beech in a gentleman's park in the county of Suffolk.

"The trees in question were greatly valued by the proprietor as objects of ornament, and various means were tried to effect a cure, and if possible, to arrest the further progress of the disease, but without any beneficial result. The beech is one of the most accommodating trees as regards soil and situation and it was evident that the disease did not arise from any peculiarity in the soil, which consisted of sandy loam, with subsoil of chalk and gravel. In hot dry seasons the trees suffered much from drought. I mention this fact because I have seen the same form of disease

amongst trees growing in wet, low-lying districts; and when seeking information from foresters and others interested in such matters, they have invariably attributed it to dampness of situation. The disease is caused by minute insects, and not as some have thought, by a species of fungus. The trunk of the tree is first attacked, and while some portions of it to all appearance remain in a healthy state, those which the insects infest gradually assume a dry appearance and when closely examined, the bark will be found to separate from the wood, and become dry and lifeless. Other unfavourable influences may, of course, favour the speedy decay of the tree, but it soon becomes evident that future healthy development is arrested, and when the trees are cut down, the ravages of the insects cease with the life of the bark. This is, I think, the most curious circumstance connected with the disease and may under careful investigation go some length to make us acquainted with means to effect its destruction. While the ravages of the insects seem to be confined to patches and districts of plantations, their existence is pretty widely spread throughout the country, and on trees growing under all circumstances. Attempts to effect a cure or to prevent the occurrence of the disease have, as far as I can ascertain, proved a failure. Other trees more valuable than the beech are in some places affected with a disease to all appearances similar; as for example, the silver firs on the estate of Dunmore near Stirling. Amongst the many plans adopted here, the only one that has succeeded to any degree is that of brushing, with a hard brush, the parts infected, when the bark is dry."

In the same journal at pp. 267–268, of the same year, attention is directed to a peculiar diseased condition of beeches at Tyninghame and Meilerstain, estates of the Earl of Haddington, in a letter from the Earl to Prof. Balfour, which was read at a meeting of the Society. The stems are said to be covered by a cottony matter, and the Earl wished to know whether it killed trees, or whether it only appeared on trees in failing health, for in every case affected trees died. In some instances the whole tree was covered and in others one side only. He had written to Mr. Hardy of Penmanshiel, who had replied that the insect was *Coccus fagi*, and gave an account of a former case noticed at Dalkeith, and also said that it occurred near London. In the discussion which followed, Mr. W. R. McNab remarked that Mr. McIntosh had noticed a similar diseased condition of the beech trees in Dalkeith Park, and had recorded the facts in the first volume of the North British Agriculturist. He seems to have considered it a fungus. Mr. McNab thought that the Coccus only appeared on trees which were already in an unhealthy condition. Dr. Balfour stated that the same species of Coccus had destroyed some beech trees in the Botanic Garden, Edinburgh, which had been planted very closely and were hemmed in by other trees and shrubs.

In the "Gardeners' Chronicle" for August 19th, 1865, p. 776, M. J. B. [Berkeley], replying to E. T., says about the Coccus that "it has been called a fungus, *Psilonia nivea*, but is an insect, and appears frequently on the bark of living trees, but that it was not known to cause death." He adds that "the drought of the previous year had been fatal to many trees which were in an

unhealthy condition and that a quantity of fine beech perished a few years earlier on Sir W. Middleton's estate. In that case it was found that the roots of the trees were extensively attacked by a fungus." In the same journal Mr. A. D. Webster alludes to the presence of the insect on the Penicuik estate, Midlothian, in 1875, in an article which appeared on October 10th, 1908, whilst several references are made to the disease in "Woods and Forests" for the years 1883 and 1884.

The following note respecting the disease appeared in vol. xxvi., p. 598 of the "Journal of the Royal Horticultural Society." "At the moment we can only speak positively of the South-east of England, but we should like to receive reports from other parts, for we fear that the beech is doomed all over the country, and that the next generation will only know by pictures and reports how gloriously beautiful our forest-beeches have been."

In the face of such gloomy predictions we find other people writing in a much more hopeful strain. In the "Gardeners' Chronicle" for July 23rd, 1904, p. 58, Mr. Brotherston writes as follows. "At present there is not a little consternation evinced concerning the safety of beeches on account of the prevalence of what used to be called *Coccus*, but now *Cryptococcus fagi*, on many trees. It is a question if this almost microscopic insect effects the amount of mischief that is laid to its charge, and on account of which so much fear is entertained concerning the very existence of so many specimens of this noble tree. For one thing it is no new pest, old people have known it all their lives and not only that, but have an acquaintance with trees that have sheltered and fed generation after generation without any apparent distress to themselves. I have watched a young tree for more than a quarter of a century, and it has gone on increasing in size and stature all that time, and at present is in the perfection of health, notwithstanding the innumerable colonies of the Beech-Coccus that are congregated on its bark. The only difference discernible between unaffected trees and this, is that the bark of the latter is covered with low, warty excrescences, in which the greater part of the Coccus congregate. These warts are no doubt a result of the insects' possession, but that they are harmful is another question. If they are responsible for the decay of the bark of beech-trees and their subsequent death, one would expect that some indication of bark decay would be apparent in this instance. But it is not.

"Still more interesting is the fact that old beech-trees in the vicinity of this young one occasionally die as they stand and some of these have not one Coccus on the bark. Two old trees within less than a stone's-throw indicate by their foliage and growth that two to five years hence will see the limit of their life. One of these has a very few Cocci here and there on its bark, which is dying in patches; the other is quite free from Coccus, and it has reached the stage when the bark is so badly decayed that pieces are falling off. Experience shows that trees such as these are decayed at the roots, a result of old age, possibly accelerated by unsuitable soil, especially when too wet. It seems to me that if the insect is indigenous, there is not much fear of its being greatly mischievous to its host. We know that its relatives, the Kermes of

the *Quercus coccifera*, and the cochineal insect, in the case of the *Opuntia*, effect no appreciable harm on these plants."

This article is of peculiar interest, as it was written from Tyninghame and refers to the same affected beech-woods, to which attention was drawn by the Earl of Haddington in 1863 in the letter to Prof. Balfour quoted in extract above.

On December 28th, 1910, Mr. Brotherston, replying to a request for information as to the present state of the beech-trees at Tyninghame, states that he notices very little difference from the condition which prevailed in 1903. He says, however, that nowhere in Scotland has he observed trees so thickly coated with Coccus as he has seen them in Herefordshire. In his letter, Mr. Brotherston refers to the death of trees in Scotland, obviously due to causes other than Coccus, as follows :—"At the same time large numbers of beech-trees have been dying and others are approaching death on many estates. It is not a question of soil, for trees growing in almost pure sand go as fast as those which have a clayey loam to root in. The symptoms, which are at first apparent, are leaves which year by year diminish in size till a spring arrives when they fail to appear, or sometimes appear to shortly wither away. When the tree is felled the main roots are usually in a condition approaching rottenness and sometimes the centre of the trunk is also rotted. But there are influences that account for these conditions. The trees are (perhaps) invariably aged for beech. Those which die at Tyninghame are over or nearly 200 years of age. At Mellerstain, Berwickshire, they are a few years younger. Protracted drought is very harmful . . . . Trees in a decaying condition also bear enormous crops of mast, not every year, but sufficiently often to lessen the vitality of the trees.

In the "Journal of the Board of Agriculture" for November, 1910, pp. 642–3, an article occurs in which a reference is made to the presence of *Cryptococcus fagi* in the forest of Charbonnière, Belgium ; in this reference it is said that the disease is not taken seriously by the Belgian forester.

A full account of *Cryptococcus fagi*, its life history &c., is to be found in "A Monograph of British Coccidae" by R. Newstead, vol. ii., pp. 215–221, plate lxx., figs. 1–10. Leaflet No. 140 of the Board of Agriculture also deals with the insect, and the treatment of the disease ; and an account of recent observations on the distribution of the Coccus in beech-woods is given by the Board of Agriculture and Fisheries in the Annual Report of the Intelligence Division, Part II, for the year 1909–10.

Personal Observations.

In the following notes on a selection of the beech-woods visited, the condition of individual trees is dealt with.

Ashridge Woods.—These, the property of Earl Brownlow, were visited on April 7th, 1910, when Mr. Wheatley, the agent, very kindly allowed the forester to accompany us. Our attention was first directed to a wood composed principally of old beech-trees. Most of these had been pollarded in their youth, and many were in

various stages of decay. The soil was shallow and heavy, overlying chalk. All through the wood large numbers of trees were in bad condition, and several were dead, but the majority carried no large amount of Coccus. Fungi occurred on the bark in many cases but those noted were saprophytic species. We were told that the Coccus had been noticed on the estate for thirty years, but that it had not increased rapidly until from twelve to fifteen years ago. For old trees, some were quite as healthy as could be expected ; others were in a bad state of decay. A small amount of Coccus was seen on most of the trees, but, except for three badly-infested specimens it was in no greater quantity than may be found in many plantations which show no signs of injury.

Of the three trees bearing the largest amount of Coccus, one was as healthy as other trees of the same age on the estate, or in woods or parks elsewhere. The second was in fair health, but the growth made in 1909 was shorter than in the previous case, while the third tree was in bad health, and had several dead and broken branches, and dead patches of bark. There were many trees in the wood in a similar condition, but which bore little or no Coccus. On other parts of the estate a little Coccus was noticeable here and there. In a plantation of trees about thirty years old (near the *Sequoia* Avenue) there was a fair amount of Coccus, but it did not seem to be doing any serious damage ; a few trees were dead, but that was due to overcrowding. In this case the Coccus was not confined to trees of a particular character, and some of the most vigorous trees had as much Coccus as any. We asked that this plantation might be kept under observation with a view to ascertaining the effect of the disease on quite young trees.

Chenies Woods.—These occupy a portion of the Duke of Bedford's Buckinghamshire estate, and they were visited on April 12th, 1910. Taken as a whole, the trees on this estate were remarkably healthy. Here and there a specimen was noted carrying a fair amount of Coccus, and a number of trees were seen which had broken off at about twenty feet above the ground. A small amount of Coccus was widely distributed on the trees, as elsewhere, but badly affected trees were few in number, isolated, and far apart. Where the Coccus was abundant, the trees, or parts of them, appeared to be unhealthy from other causes, at any rate, in many instances ; and the same trouble was found to exist on trees which carried little or no Coccus. Cases were seen in which there was a dead strip of bark free from Coccus, while adjacent healthy bark was covered with Coccus. Many trees were seen on which the bark was dead or dying, and peeling off at about fifteen or twenty feet from the ground. Some of these had Coccus on, others had none, and bore no signs of having had any. The cause of injury could frequently be traced to a wound.

Dead bark full of a fungus was often seen near a stump of a branch, the fungus being also present in the wood. Where the bark was dead at fifteen or twenty feet from the ground, the bark at the base was in good condition. In other cases dead patches of bark were found about the bases of the trunks and the roots, while the bark higher up was healthy.

In cases like the latter a small black fungus (*Melogramma spiniferum*) was found on the dead bark. Where the bark dies higher up, there is often a minute reddish fungus (*Nectria ditissima*) present. These species have been identified by Mr. Massee ; both are parasitic,* and appear to account for the death of many trees. The same conspicuous saprophytic fungus, noted in the Ashridge Woods, was also found here on the dead and dying trees.

Micklefield Hall Woods, Rickmansworth.—Mr. Clutterbuck, the owner of these woods, kindly accompanied us on April 19th, 1910, and pointed out various diseased trees which he had had under observation. We first examined two beech-trees standing on the edge of a wood, the trunks being within a few feet of one another and the branches interlaced. In the case of one tree, parts of the stem and main branches were thickly covered with Coccus, while the other tree was almost free from it. The two trees had remained in about the same state for some years, and, as far as one could judge, they were both fairly healthy. They are admirably placed for observation, and Mr. Clutterbuck intends to note carefully any changes in their condition which may occur. Most of the trees in the vicinity were fairly free from Coccus, with the exception of one middle-aged tree, which stood at about one hundred yards from the two trees mentioned above. There was a large amount of Coccus on this tree, but the growth of the tree appeared normal. On ascending the tree, it was found that there was a large patch of dead bark running down the trunk in an irregular manner for a distance of two or three feet. This dead bark originated just below a wound, and there was nothing to show that it had any connection with the Coccus.

Coccus was also noted on other parts of the estate, but was nowhere so bad as on the trees already referred to. On the outskirts of a distant wood, we were told that a bad tree had been cut down two or three years ago ; close to where this tree stood, Coccus was noticed on several trees, but none of them were really badly attacked, and they were scattered amongst other trees which were practically clean. We were told that trees which had been killed, or were reputed to have been killed by Coccus, had very dry bark and were hard to cut. The woods were kept very free from dead trees.

Hall Place, Maidenhead.—This, the estate of Sir Gilbert Clayton-East, was visited in the company of the owner on May 19th, 1910. Our attention was directed to this estate in connection with questions referred to the Board of Agriculture, by Sir Gilbert, respecting Coccus and diseased beech-timber. The death of several large trees bearing Coccus had been reported, and samples of timber from living trees showing brown discoloration had been sent for examination. At the time of our visit, though Coccus in small quantity was fairly general, as in other districts, only a few trees had a large amount on the bark. From the general appearance of these trees, they are at present in good average health. Several dead trees

* *Nectria ditissima* is a wound parasite. *See* Massee, "Diseases of Cultivated Plants and Trees," p. 183.

bearing Coccus were seen in other parts of the woods; these appeared to have been killed by fungus in most cases. Specimens of fungus-infested bark and wood were brought away, and the fungi were subsequently identified by Mr. Massee as being identical with the parasitic species previously recorded.

In a portion of one wood where trees were being felled, our attention was directed to dark stains which occurred in much of the timber. The stains were dark brown and usually confined to the central part of the trunk. In one or two cases local stains of this kind appeared to be connected with wounds, but in the majority of cases, in which the stain was continuous through the length of the trunk, it was probably due to the trees having experienced a severe check at some past period. Such a check might have been brought about by drought, especially as the trees had been grown on a steep hill-side in clayey ground. The following table of the rain-fall at Hall Place, for 17 years from 1893, kindly given to us by Sir Gilbert Clayton-East, shows two years, 1893 and 1898, which might well be responsible for a severe check.

1893.	78 days drought.	1900.	22·17 inches.
„	33 „ „	1901.	21·48 „
„	219 days with only slight rain-fall.	1902.	20·37 „
		1903.	37·95 „
1894.	27·62 inches.	1904.	23·63 „
1895.	20·08 „	1905.	22·12 „
1896.	23·02 „	1906.	25·64 „
1897.	22·04 „	1907.	25·45 „
1898.	17·10 „	1908.	26·81 „
1899.	22·17 „	1909.	28·13 „

On this estate our attention was specially directed to black blister-like swellings on the trunks of beech-trees. These blisters were filled with a yellowish liquid which had an offensive smell. Some connection was suggested between them and Coccus. Similar blisters had been noted on other occasions. As a rule they are little more than from one to two inches across, and their action seems to be purely local. They appear to be of the same nature as slime-flux.

Latimer Woods.—These, the property of Lord Chesham, were visited on October 18th, 1910. In the company of the forester various infested trees were examined. There appeared to be rather more Coccus in these woods than in those already referred to, but nothing more could be learnt respecting the action of the Coccus than in former visits. A number of trees broken off from 15 to 20 feet from the ground were noted. These were similar in every respect to broken trees on other estates, and bore the same parasitic and saprophytic fungi. The black watery blisters noticed in other woods were present at Latimer, and they were attributed to the action of Coccus. This theory was not, however, borne out, for similar blisters were found on trees which showed no sign of Coccus, and one large tree which was badly blistered and had much of the bark about the base killed, was practically free of Coccus, and showed no signs of ever having carried any. This tree was, however, reputed to have been brought to its present condition by Coccus, which was assumed to have been previously present.

In addition to the estates referred to, notice has been taken of the disease in various parts of Lancashire, Cheshire, Norfolk, South Wales, Scotland, &c. An interesting case was noticed at Sandringham. A tree about 40 years of age was covered with Coccus more thickly than any tree noted elsewhere. The leaves and young growths appeared to be quite healthy ; the tree however, for various reasons, had to be cut down, and on the timber being split up, it was found to be as clean and as full of sap as unaffected trees could be expected to be.

Microscopic Investigations.

A microscopic examination was made of numerous specimens of bark from trees badly affected with Coccus and from clean trees, also from pieces of bark thickly coated with Coccus and from bark of the same trees where little or no Coccus was present. Among these specimens differences were noted as regards the amount of sclerotic tissue in the bast, and the amount of cell-contents in the young bast ; but in neither of these particulars did there appear to be any constant character associated with the presence or absence of Coccus. Here and there under a small thick patch of Coccus a brown spot was found in the bark. This often included a few dead cells near the surface and showed a layer of cork dipping a little deeper than elsewhere, but the greater part of the bark appeared to be unaffected. Sucking tubes of the insects were met with here and there in the outer tissues of the bark, sometimes reaching to a depth of one millimeter.

In a certain number of trees small watery blisters are found on the lower part of the trunks, and are attributed by some people to the action of the Coccus, but no connection between the two was found.

Summary.

There can be no doubt that the Coccus is widely distributed about the country at the present time, as it has been for the last 50 years. It is also equally evident that it has, on the whole, increased in quantity during the last 15 years, but that it is doing any serious amount of harm, or that it is likely to do so, is doubtful. In some of the early records the disease appears to have been quite as plentiful as it has been of late years, and to have caused the same uneasiness, but the worst expectations were never realised.

There can also be little doubt that climatic conditions, varying from time to time, favour its increase or decrease. The recent increase of the disease may probably be accounted for by the series of mild winters which succeeded the severe one of 1894–5. This may have favoured the spread of the Coccus on trees, which had been weakened by the succession of dry summers commencing with 1893. Beech-trees in many parts of the country showed signs of deterioration as an effect of these droughts. On the other hand, the Coccus appears to have made scarcely any progress during 1909–10 in most districts. This may be explained as due to the winter of 1909 being the most severe for several years past, and the summers of 1909 and 1910 being wet and cold. These conditions

were probably unfavourable to the growth of the Coccus. Thus drought and mild winters would appear to provide the exact conditions under which it is possible for the Coccus to thrive, whilst enfeebled health of the trees (due primarily to drought and in some cases accelerated by old age) makes them peculiarly susceptible to insect attacks.

From what we can learn, however, the Coccus appears to cause very little real harm by sucking the juices of the trees, though doubtless, if an already enfeebled tree is badly infested, a certain amount of further injury must take place, for it is not in a condition to spare even the small amount of food-substances which the insect requires.

The insect may thus be regarded as doing a small amount of harm by extracting sap from the outer bark, but any injury it may cause would be infinitesimal when compared with Saw-flies and other leaf-eating insects and with various fungoid pests.

That the Coccus has not assumed an epidemic stage is apparent everywhere, for, though scores of trees may be found carrying traces of Coccus, it is only a tree here and there that is badly affected, and those trees are usually far apart.

In much that has been written on the subject, it appears to have been taken for granted that the Coccus eventually kills the trees on which it finds a home, and the same opinion prevails largely amongst foresters and other people. But there is very little evidence to prove that careful observations have been taken of particular trees, to ascertain whether death can be traced directly to the insect, or whether some other less conspicuous agency may not have played the responsible part and been wholly or partially the cause of death. Further, it is difficult to obtain reliable information as to the length of time a tree, which is said to have been killed by Coccus, lived with a considerable amount of Coccus on the bark. Some people assert that a period of seven or eight years is required to kill a tree after the disease has obtained a footing ; others maintain that three or four years is quite long enough, whilst still others have known trees to be thickly covered for a period of from 12 years upwards, and be vigorous still, as in the case of the tree mentioned in Mr. Brotherston's article. Trees at Kew have been known to bear Coccus for at least 20 years, and no serious effects have been traced to it.

The conclusion we have arrived at is that while the Coccus is doing very little harm, certain fungoid pests account for a serious amount of injury, which is usually credited to Coccus. On all the dead trees pointed out to us as having been killed by Coccus, we found destructive parasitic fungi present, which alone would account for the death of trees. The same fungi kill or injure other kinds of trees on which the Beech Coccus does not occur.

Two parasitic species were common. In cases where the trees had broken off 15 or 20 feet from the ground, in the region where the fructification of the fungus (the wound parasite, *Nectria ditissima*, Tul.) was most prevalent, patches of a dull red colour were seen on the bark. They were not conspicuous and might be easily overlooked. The patches were due to numerous minute, red, granular lumps, which form the fructification of the fungus. The

roots and bases of the trunks of such trees were quite healthy. It is of interest to note that a section of beech-wood shown in the Forestry Section of the Glasgow Exhibition, which is said to have been cut from a tree killed by Coccus, has its bark thickly covered with the fructification stage of *Nectria*.

Other instances of dead trees occurred where the roots had died first. A black fungus (*Melogramma spiniferum*, De Not.) was present in this case, and was seen breaking through the bark of the exposed parts of the roots and the base of the trunk.

It has been frequently noted that such trees die suddenly, soon after the leaves expand, or during the summer. This may be accounted for by the fungus, which has been present for a long period, and has affected the health of the trees, at last becoming so abundant as to prevent the efficient working of the conducting tissues at a time when they ought to be working at full pressure.

The fructification of the black fungus referred to above, though larger than the *Nectria*, is also small and not very conspicuous.

A conspicuous fungus was present on a large number of dead and dying trees and was often seen accompanying the *Nectria*. The fructifications are greyish, fan-shaped, and often two or three inches across. It has been identified as *Polyporus adustus*, Fr., and though it may be purely saprophytic and not harmful to living trees, it has been suspected of having parasitic tendencies. (Massee, Diseases of Cultivated Plants and Trees, p. 387.)

Trees attacked or killed by the *Nectria* or the *Melogramma* are a serious source of infection to other trees, and ought to be removed and burnt at once, and not be left lying where they fall as is too often the case.

The fact of certain trees dying as they stand probably accounts for the hardness of the wood and bark, which has been noted by some people, and has been attributed to the action of the Coccus.

The Weymouth Pine, *Pinus Strobus*, is subject to attack by an insect, which protects itself with a waxy covering, and thus resembles the Beech Coccus. This has led to the belief that a connection exists between the disease on the two trees. This, however, cannot be the case, for the Weymouth Pine insect is known to be a species of *Chermes* (*C. strobi*) and thus belongs to a different group of insects from the Beech Coccus.

Regarding isolated park trees, these are often past their prime, and sometimes suffering from injuries caused by storms, etc. Coccus, when present, is usually put down as the cause of ill-health, when such occurs, but really it is only one of several things which may be tending to lessen the vitality of the trees. Apart from the extraction of sap, the presence of a dense accumulation of Coccus on the bark is probably injurious; therefore, even though Coccus may not do any serious harm, it is advisable to remove it in the case of park and garden specimens at any rate. This may be done by spraying or washing the trunks of affected trees with paraffin emulsion or a caustic wash as recommended in the Board of Agriculture leaflet. At the same time it is necessary to take steps to combat other and more serious diseases which may be present, and as far as possible to repair at once any damage which may be done by storms or other agencies. As previously stated diseased

trees in woods should be removed as soon as noticed, unless the injury is of a trifling character and can be easily treated.

The frequency with which trees broken off at from 15 to 20 feet from the ground are met with appears to us to require more than passing notice. The fact of their breaking at this point is due to the wood becoming rotten in this region though it is healthy above and below. As the fructification of *Nectria ditissima* is chiefly to be seen in the same region, it is thought that this fungus may be principally responsible for the rottenness of the wood. The fungus being a wound parasite an explanation of this localisation of attack should be attempted. Wounds made by fallen branches would account for the entrance of the fungus, but the badly diseased places would then be expected to occur on various parts of the trunk from base to summit, therefore some other cause must be looked for. It has occurred to us that this may be sunburn following thinning of the trees. During a certain part of the day this portion of the trunk, which had hitherto been shaded, may be exposed to the sun and strongly heated, while the upper and lower parts of the trunk remain shaded. The heating would be likely to kill the bark, with the result that it would probably crack and enable fungus spores to gain an entrance.

Fructifications of *Polyporus adustus* are also common on the same region of the trunk.

The black fungus, *Melogramma spiniferum*, as stated above, is generally found on the roots and on the base of the trunk. These parts of the tree are very liable to bark-injuries by animal and human agency. Such injuries would account for the inlet of the fungus spores.

XLVI.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LXII.

611. **Biophytum Foxii**, *Sprague* [Geraniaceae-Oxalideae]; affine *B. somnianti*, G. Don, a quo bracteis quam floribus brevioribus, sepalis pro rata latioribus minus attenuatis differt.

Herba erecta, caule 5·5 cm. longo appresse piloso. *Folia* 8, apice caulis quasi verticillata, 3·5–8 cm. longa, 3–6-juga; foliola terminalia oblique obovata, 2–3·2 cm. longa, 1·3–2·2 cm. lata, cetera deorsum sensim minora, basi truncata, intermedia subtrapezoidea, infima triangulari-ovata. *Pedunculi* 4 cm. longi, crispule pubescentes, multiflori. *Sepala* oblonga, acuminata, setula 0·5–1 mm. longa terminata, 6·3 mm. longa, 1·7 mm. lata, pilis acutis minute ciliata, extus papillato-pilosa, 7–9-nervia. *Corolla* alba, ima basi excepta gamopetala; tubus 6 mm. longus, basi foraminibus 5 triangularibus vix 0·5 mm. longis; lobi reflexi, oblongo-obovati, explanati 4·5 mm. longi, 3·5 mm. lati. *Stamina* longiora antisepala, breviora antipetala; filamenta breviora 3–3·3 mm. longa, sursum angustata, glabra, extus basi glandula vix 0·4 mm. diametro;

filamenta longiora 4·7 mm. longa, extus pilis acutis et papilliformibus minute pilosa, basi leviter angustata, vix glandulosa. *Pistillum* 1·7 mm. longum, superne per 1 mm. minute pilosum.

Peru. Described from a living plant collected by *Mr. Walter Fox*, and presented by him to Kew in 1911.

612. **Hedyotis glauca**, *W. W. Smith* [Rubiaceae-Hedyotideae]; species *H. uncinellae*, Hook. et Arn., comparabile, sed caule terete foliis lineari-lanceolatis floribus valde diversis distinguenda.

Herba (annua ?), 1–1·2 m. alta, erecta. *Caulis* simplex, teres, remote foliosus, lineis duabus fulvo-pilosis instructus, ceterum glaber, glaucus. *Folia* opposita, paulo recurva, lanceolata vel lineari-lanceolata, acuta, semiamplexicaulia, 8–15 cm. longa, 0·3–1·5 cm. lata, scabridule serrulata, supra subglabra, infra in venis numerosis distinctis plus minusve parce scabridula; stipulae cum foliis conjunctae, 3–5 mm. longae, pectinatae, pilosae. *Flores* in cymas globosas terminales et axillares 1·5 cm. diametro bracteatas multifloras dispositi, more *H. uncinellae*; bracteae lineares, ad 4 cm. longae. *Calyx* vix 1 mm. longus, glaber, dentibus quatuor subaequalibus triangularibus erectis vix 0·5 mm. longis glabris. *Corolla* infundibuliformis, 3 mm. longa, carnea, tubo brevi glabro fauce longiore, intus albo-pilosa, lobis minutis triangulari-ovatis acutis erectis. *Stamina* 4, fauci corollae inserta, inclusa, filamentis perbrevibus. *Ovarium* 2-loculare, stylo filiformi, loculis plus minusve 6-ovuliferis. *Fructus* deest.

Burma. Upper Burma: Kachin Hills; near Myitkyina, *Shaik Mokim*, 86.

India. Assam: district of Darrang; Charali, near Bishnath, *Burkill*, 32,470. Burkill records the flowers as flesh-coloured and the plant as standing up sporadically in the tall grass.

613. **Styrax Lacei**, *W. W. Smith* [Styracaceae]; species inter *Imbricatas*, Gürke, calyce brevi, annulo staminum maximo conspicua; ab aliis speciebus indo-burmanicis remota; in monographia *Styracacearum* auctore cl. Perkins prope *S. hypoglaucum* ponenda.

Arbor mediocris ?; rami robusti, longitudinaliter sulcati, 3–4 mm. diametro, juniores parce tomentelli mox glabrescentes. *Folia* alterna, petiolata, petiolo 1–1·5 cm. longo tomentello, oblonga vel elliptico-oblonga, 12–15 cm. longa, 5–7 cm. lata, apice breviter acuminata vel acuta, basi cuneata, coriacea, integra vel subintegra, minute glanduloso-denticulata, supra glabra, subtus minute cinereo-stellato-tomentella, supra nervis venisque subimmersis (in sicco) subtus satis prominentibus; nervis lateralibus 5–8-jugis parce stellato-pilosulis ad marginem non pertinentibus subparallelis. *Inflorescentia* racemosa vel subpaniculato-racemosa, 3–4 cm. longa, axillaris vel terminalis, 10–20-flora; bracteae minutae, lineares; rhachis stellato-tomentella. *Flores* (albidi ?) circiter 1 cm. longi; pedicelli 2 mm. longi. *Calyx* cupuliformis, brevissimus, 1 mm. longus, 3 mm. latus, margine subinteger, vix denticulatus, tomentellus. *Corolla* 5-partita, tubo brevissimo, lobis in aestivatione imbricatis membranaceis 8 mm. longis 4 mm. latis lanceolatis extus minute tomentellis intus parcius. *Stamina* 10, inferne in tubum glabrum 6 mm. longum cohaerentia, filamentorum parte libera antheris multo breviore; antherae in tubo fere sessiles, margine stellatis

pilis parce ornatae. *Ovarium* immaturum obovoideum, tomentellum, in juventute 3-loculare, stylo in parte inferiore piloso ceterum glabro, stigmate subtrilobato. *Fructus* deest.

Burma. District of Katha: Kadu Hill, 1000–1300 m., *Lace*, 5107, in Herb. Kew. et Calcutta.

614. **Solandra Hartwegii**, *N. E. Brown* [Solanaceae-Atropeae]: affinis *S. guttatae*, Don, sed foliis et calyce glabris, corolla majore, tubo breviore differt.

Frutex ramosus; rami 8–10 mm. crassi, glabri. *Folia* alterna, plus minusve aggregata, glabra; petiolus 2·5–8 cm. longus, supra leviter bicanaliculatus; lamina 10–17·5 cm. longa, 4·5–12 cm. lata, elliptica, acuta, breviter acuminata vel obtusa, basi acuta. *Flores* solitarii, terminales. *Pedicelli* 1·2–2 cm. longi, 8–10 mm. (siccati 5–7 mm.) crassi, in calyces sensim transientes, glabri. *Calyx* 5–7 cm. longus, 2–2·2 cm. diametro, 5-angulatus, inaequaliter 3–4-lobus, glaber, viridis. *Corolla* 20–25 cm. diametro, lutea, vittis 5 fusco-purpureis notata, glabra; tubus calyce multo longior, infra medium cylindrico-tubulosus, supra medium late infundibuliformis; limbus 5-lobus; lobi 7–8·5 cm. longi, 5–7 cm. lati, oblongi, apice rotundati, integri vel inaequaliter lobati, plus minusve crispati. *Stamina* 9–10 cm. longa; filamenta ad insertionem villosa, lutea; antherae 1·2 cm. longae, pallide brunneae. *Stylus* 16–25 cm. longus, glaber, apice purpureus. *S. grandiflora*, Benth. Pl. Hartw. p. 69, nec Swartz.

Mexico. Llano Verde, *Hartweg*, 500, and cultivated specimen.

This fine species was originally discovered by Hartweg in 1839 and mistakenly identified with *S. grandiflora*, Sw., and subsequently with *S. guttata*, Don, from both of which it is entirely different. A living plant of it was introduced from Mexico over 30 years ago by Mr. Moxam, formerly of Leyton in Essex. This plant or a portion of it was obtained and cultivated as *S. grandiflora* by Mr. J. C. Daubuz, at Truro, in Cornwall, whence it was obtained by Sir Frederick Moore, Keeper of the Royal Botanic Gardens, Glasnevin, Dublin, who forwarded it to Kew for determination.

615. **Veronica Birleyi**, *N. E. Brown* [Scrophulariaceae-Digitaleae]; affinis *V. spathulatae*, Benth., sed ramis crassioribus, foliis subsessilibus et pedunculis multo brevioribus differt.

Suffrutex nanus, 10 cm. altus, ramosus; rami erecti, saepe flexuosi, 1–2 mm. crassi, puberuli demum sublignosi et glabri. *Folia* conferta vel inferiora ad 4 mm. remota, subsessilia, crassa, 6–9 mm. longa, 4–9 mm. lata, cuneato-obovata vel orbiculata, basi plus minusve cuneata, breviter et obtuse 3–7 loba, utrinque puberula, rubrotincta. *Flores* pauci, magni, prope apicem ramorum axillares. *Pedunculi* 2–3 mm. longi, 1–2-flori, bibracteati; bracteae 4–5 mm. longae, lineari-spathulatae, obtusae, glanduloso-puberulae. *Pedicelli* 1–1·5 mm. longi, glanduloso-puberuli. *Calyx* 4-partitus; lobi 5–6 mm. longi, 2·5–2·75 mm. lati, oblongi, obtusi, glanduloso-puberuli. *Corolla* "magna, 5-mera, alba" (*Gibbs*). *Capsula* 5 mm. longa, 4–4·5 mm. lata, glabra, in lobos oblongos obtusos 4 disrupta.

New Zealand. South Island: between rocks on the top ridge of Mount Bonpland, near Lake Wakatipu, 2435 m., Feb., 1908, *Miss L. S. Gibbs*, 1172.

Allied to *V. spathulata*, Benth., but differs in having much stouter branches, subsessile leaves, a finer and entirely different pubescence and very much shorter peduncles. The corolla, according to Miss Gibbs, was white, about $\frac{3}{4}$ inch in diameter, with 5 subequal lobes; several were collected, but unfortunately they were lost. The name is given in honour of Mr. Harry Birley, a well-known guide in the district, who accompanied Miss Gibbs when this plant was collected.

616. **Alloplectus (Nautilocalyx) hirsutus**, *Sprague* [Gesneriaceae-Cyrtandreae]; affinis *A. Forgetii*, Sprague, a quo foliis brevius petiolatis viridibus basi cuneatis marginibus planis recedit.

Herba e basi ramosa, circiter 5 dm. alta, caulibus pluribus erectis teretibus crassis carnosis breviter villosis 1–1·2 cm. diametro, internodiis 2–6 cm. longis. *Folia* oblanceolata, breviter acute acuminata, apice recurvula, basi cuneata, 15–16 cm. longa, 6 cm. lata, plus minus bullata, supra nitidula, nervo medio inferne pilosulo excepto glabra, nervis venulisque supra conspicue impressis subtus prominentibus breviter villosis; nervi laterales utrinque 10–11; petioli plano-convexi, supra leviter excavati, 1·8–3 cm. longi, circa basin 6–7 mm. lati. *Cymae* sessiles, instar fasciculorum, 4–8 florae; bracteae transversae 2 cm. longae, 6 mm. latae, extus breviter villosae; pedicelli sub anthesi vix 1 cm. longi, demum aucti. *Calycis* segmenta ovato-lanceolata, acute acuminata, 1·8–2 cm. longa, 5·5–6 mm. lata, extus breviter villosa; segmentum posticum calcare corollae basi repulsum. *Corolla* pallide flava, 3 cm. longa calcare excluso, extus breviter villosa; tubus 3·2 cm. longus calcare incluso, ab 0·8 cm. usque ad 1·3 cm. supra basin organicam ampliatus, abhinc usque ad os 9·5 mm. latus, a dorso usque ad ventrem 7 mm. metiens, intus antice glaber, postice minute glanduloso-pilosus; calcar amplum, rotundatum, 3 mm. longum, 4·5 mm. latum; limbus 1·5 cm. latus, a dorso usque ad ventrem 1·3 cm. metiens; lobi transverse elliptici, patuli. *Filamenta* in vaginam postice fissam corollae tubo adnatam connata, basi praecipue postica extus glanduloso-pilosa, vagina antice 0·8 mm. alta, lateraliter 0·5 mm. alta; antherae 1·75–2 mm. longae, loculis omnino sejunctis parallelis mytiliformibus, connectivo crasso convexo 1·75 mm. longo 1·3 mm. lato. *Disci* glandula unica, postica, ovata, glabra, 2·4 mm. longa, basi vix 2 mm. lata. *Ovarium* 3 mm. longum, pilis multicellularibus acutis villosum; stylus pilis aliis glanduloso-capitatis aliis longioribus acutissimis dense indutus; placentae ad basin bipartitae, segmentis plano-convexis introrsum tantum ovuliferis.

Peru. Collected by *Forget* for Messrs. Sander & Sons, St. Albans, by whom a plant was presented to Kew.

617. **Alloplectus (Nautilocalyx) pallidus**, *Sprague* [Gesneriaceae-Cyrtandreae]; foliis magnis pallide glaucescenti-viridibus specie glabris, petiolis brevibus necnon corollae colore distinctus.

Herba e basi ramosa, circiter 5 dm. alta, caulibus pluribus erectis teretibus crassis carnosis nitidulis breviter pilosis inferne circiter 1·7 cm. diametro superne 8–9 mm. diametro, internodiis 3·5–7·5 cm. longis. *Folia* opposita, ovato-lanceolata, apice breviter acute acuminata, recurva, in basin sensim angustata, 16–25 cm. longa, 6·5–10·5 cm. lata, margine plana, crenato-serrata, sparse ciliata, supra nitidula, pallide viridia, pilis paucis appressis inconspicuis

exceptis glabra, nervis venulisque conspicue impressis, subtus opaca, albido-viridia, prima visu glabra, revera nervis sparse puberulis mesophyllo minutissime puberulo, nervis prominentibus, lateralibus utrinque 12–14, venulis prominulis ; petioli 0·8–2 cm. longi. *Cymae* 3–6-florae, bracteis duabus transversis patulis lanceolatis acutis primum circiter 8 mm. longis demum usque ad 1·5 cm. longis sparse ciliatis extus puberulis intus glabris ; pedicelli sub anthesi circiter 2·5 c.m. longi, villosi, demum elongati. *Calyx* zygomorphus ; segmenta ovata, acute acuminata, basi rotundata vel subcordata, 2·4–2·5 cm. longa, 1·4–1·7 cm. lata, tenuia, denticulata, sparse ciliata, extus sparsissime puberula, intus glabra ; segmentum posticum calcare corollae basi repulsum valde curvatum. *Corolla* e calyce ascendens, cremeo-albida, dorso calcarata ; tubus calcare incluso 5 cm. longus, extus breviter crispule pilosus, intus antice glabriusculus, purpureo-striatus, postice minute glanduloso-pilosus, purpureo-vittatus, vittis e maculis numerosis subcontiguis compositis, circiter 1·5 cm. supra basin calcaris ampliatus, abhinc usque ad os 1·1 cm. latus, a dorso usque ad ventrem circiter 9 mm. metiens ; calcar amplum, rotundatum, circiter 5 mm. longum ; limbus 3 cm. latus, fere 3 cm. a dorso ad ventrem metiens ; lobi leviter reflexi, transverse elliptici, 1·1–1·2 cm. longi, 1·4–1·6 cm. lati. *Filamenta* in vaginam postice fissam in calcar 3 mm. productam corollae tubo adnatam connata, superne antheris disjunctis spiraliter torta, antica longiora, vagina antice 7·5 mm. longa, lateraliter 5 mm. longa ; antherae per paria apicibus connectivorum connata, 3 mm. longae, connectivo dorso valde incrassato 2·5 mm. longo 1 mm. lato ultra loculos 0·5 mm. dorsaliter prominente, loculis omnino sejunctis parallelis mytiliformibus. *Disci glandula* unica, postica, 2·5 mm. longa, sparse longiuscule ciliata. *Ovarium* ovoideum, 5 mm. longum, pilis multicellularibus acutissimis dense indutum ; stylus vix 3 cm. longus, pilis multicellularibus acutissimis et paucioribus glanduloso-capitatis patule hirsutus ; placentae ad basin bipartitae, segmentis plano-convexis introrsum tantum ovuliferis.

Peru. Collected by *Forget* for Messrs. Sander & Sons, St. Albans, by whom a plant was presented to Kew. The corolla is creamy white, with a broad band of purple blotches inside the tube on the posticous side and about 9 purple lines on the anticous.

618. Staurogyne shanica, *W. W. Smith* [Acanthaceae-Nelsonieae]; inter species orientales proxima *S. debili*, Clarke, ex insulis Philippinis, speciei imperfecte descriptae ; foliis coriaceis, subtus tomentellis, inflorescentia magis contracta inter alia distinguenda.

Herba 15–20 cm. alta, suberecta. *Caulis* simplex vel parce ramosus, teres, nodosus, dense fulvo-tomentellus. *Folia* opposita, lanceolata vel oblongo-lanceolata, apice obtusa, basi cuneata, 4–8 cm. longa, 1–2·5 cm. lata, margine paululum undulata, coriacea, supra minute scabridula, in costa tomentella, subtus praesertim in venis dense tomentella, supra nervis immersis indistinctis subtus conspicue reticulatim prominentibus 6–10-jugis ; petioli ad 1 cm. longi, tomentelli. *Flores* in racemos terminales vel pseudo-axillares vix elongatos 8–15-floros dispositi ; bractea bracteolaeque duae similes, lineares, 2–3 mm. longae ; pedicelli 2–3 mm. longi. *Calyx* 5-partitus, in lobos lineares 6–8 mm. longos minute pilosulus. *Corollae* tubus 1 cm. longus ; lobi subaequales, rotundati, breves. *Stamina*

didynama, filamentis undique sed parce pilosis. *Fructum* maturum non vidi.

Burma. Southern Shan States: near Keng Tung, 1000 m., *Macgregor*, 755 bis, in Herb. Kew. et Calcutta.

619. **Fimbristylis Lacei**, *Turrill* [Cyperaceae-Scirpeae]; affinis *F. distichae*, Bcklr., sed anthelae radiis pubescentibus, glumis angustioribus acutioribus differt.

Planta annua; culmi erecti, ad 12 cm. alti, graciles, basi foliati. *Folia* numerosa, linearia, curvata, apice acuta, ad 7 mm. longa, 2 mm. lata, glaucescentia, margine scabra. *Anthela* e radiis 3–6 pubescentibus, spiculis 3–7 constituta; bracteae breves, foliosae. *Spiculae* 6–8-florae, 5–7 mm. longae, 1·5 mm. latae, rhachilla haud torta. *Glumae* distichae, cymbiformes, 2·5 mm. longae, 0·75 mm. latae, minute puberulae, brunnescentes, carinis angustis scabris, ad margines anguste membranaceae. *Stamina* 2, filamentis 2·75 mm. longis, antheris linearibus 0·6 mm. longis haud apiculatis. *Stylus* 1·5 mm. longus, glaber, cum basi incrassata deciduus, ramis 3, 1 mm. longis. *Nux* obovoidea, faciebus 3 convexis, 0·75 mm. alta, 0·6 mm. diametro, alba, vix verrucosa, haud stipitata, cellulis epidermatis hexagono-rotundis.

Burma. Upper Chindwin District: Sittung; Tammu Road, 150 m., *Lace*, 4210.

Malay Archipelago. Borneo: Tenom; "Residency," burnt clearing paths, 240 m., *Gibbs*, 2771.

620. **Fimbristylis tortispica**, *Turrill* [Cyperaceae-Scirpeae]; ab affini *F. disticha*, Bcklr., partibus omnibus majoribus, spicularum rachillis tortis facile distinguenda.

Rhizoma nullum vel brevissimum. *Culmi* erecti, ad 5 dm. alti, rigidiusculi, basi dense foliati quasi bulboso-incrassati. *Folia* numerosa, linearia, plus minusve curvata, apice obtusa, minute apiculata, ad 13 mm. longa, 2·5 mm. lata, glauca, margine scabra. *Anthela* radiis ad 7 laevibus. *Bracteae* breves, ad margines ciliato-scabrae. *Spiculae* 9 mm. longae, 2 mm. latae, rhachilla semel vel saepius bis torta. *Glumae* subdistichae, late ovatae, mucronatae, 3 mm. longae, 2·5 mm. latae, glabrae, in parte superiore castaneae in parte inferiore et ad carina stramineae, ad margines anguste membranaceae. *Stamina* 3, filamentis 3 mm. longis, antheris linearibus 1·5 mm. longis apiculatis. *Stylus* 2 mm. longus, glaber, cum basi incrassata deciduus, ramis 3 gracilibus, 2 mm. longis. *Nux* obovoidea, faciebus 3 convexis, 1 mm. longa, 0·75 mm. diametro, alba vel straminea, verrucosa, non stipitata, cellulis epidermatis hexagono-rotundis.

Indo-China. Siam: Chiengmai; Doi Sootep, growing singly in deciduous jungle, 330–540 m., *Kerr*, 1271.

XLVII.—MISCELLANEOUS NOTES.

Mr. Thomas Hunter, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of the Gold Coast.

Peat-Moss Litter Manure.—The supply of farmyard manure for use in the Royal Botanic Gardens, Kew, is obtained in the neighbourhood from contractors, bus proprietors, and others who keep a number of horses. For some years a considerable proportion of the manure thus obtained has been made with peat-moss litter, imported we believe from Denmark, and composed chiefly of compressed dead moss and bog peat, as it has been formed in marshes, &c. It is neither peat nor moss as these are understood in horticulture and is entirely unsuited for the growth of plants. It is imported in the form of bales which are broken up in the stables to be spread as bedding in the stalls. When it becomes saturated with urine and contains a considerable proportion of horse droppings it is thrown into a heap to be carted away. Compared with straw-made manure this moss-litter manure is cheap, but it is not looked upon with favour by market gardeners. Its use at Kew has been mainly as a top dressing for lawns and borders, but only after it has been exposed to the air for about six months and turned several times. It has not been used for mixing with the soil, but this spring some of the flower beds were in error manured with it. Its effect on the health and growth of the plants which were afterwards put into these beds for the summer was markedly deleterious. The plants not only failed to start into growth, but many of them weakened and died, and as this was evidently due to the manure in the soil in which the plants were set, samples of the soil and manure were submitted to Dr. J. A. Voelcker for analysis and report, and we are indebted to him for the following analysis and observations.

Dr. Voelcker writes as follows :—

"I have now completed my examination of the sample of Soil and that of Peat-Moss Manure which you sent me some time back.

"The analysis of the Peat-Moss Manure is as follows :—

Moisture	39·59
*Organic matter and salts of ammonia	46·87
Oxide of iron and alumina, with traces of phosphoric acid	1·49
Lime	·90
Alkalies, magnesia, &c.	4·81
Insoluble siliceous matter	6·34
	100·00
*Containing nitrogen	2·11
Equal to ammonia	2·56

"The manure further contained :

Matters soluble in water—	
Nitric acid	·01
Sulphuric acid	·33
Chlorine	·09

"The manure was distinctly acid in reaction, and showed :—

Acidity—reckoned as acetic acid ... ·88 per cent.

"Of the soil a water extract was made, and this gave :—

Total matters soluble in water ... ... ·098 per cent.

"Of this ·046 per cent. consisted of organic matter, and ·052 per cent. of mineral matter, this latter being mostly sulphate of lime. There was only a trace of chlorine in it but a marked quantity of nitrates was present.

"In the examiation of the manure and soil alike there was not detected anything leading to the belief that disinfectants, deodorisers, &c., had been used with the manure.

"To come next to anything that may possibly have caused the losses experienced with the plants in consequence of using the manure in question—it does not appear, from my examination, that any mineral acid or the like has been used with the manure, nor do I think that any disinfectant, such as carbolic acid, has been employed with the manure. Yet the evidence you have kindly collected and put at my disposal does undoubtedly tend to show that ill results have followed the use of this particular manure. I have, therefore, carefully considered the matter from the light of practical experience and supplemented this with such facts as the analyses have brought out.

"Undoubtedly there is a strong prejudice among gardeners, and market gardeners in particular, against the use of farmyard manure made with Peat-moss litter. To what that prejudice is due I have not been able exactly to find out. But there remains the fact that market-gardeners will not use this manure until it has been kept stored for a considerable time—say quite two years. After that time it is reckoned safe to use. You inform me that the manure in question was not absolutely fresh but had been kept some time, though, it would appear, nothing like the two years mentioned.

"I have come to the conclusion—from my examination—that the ill effects in the present case are due to the marked acidity of the manure, this acidity being due to organic acids in the manure and not to mineral ones. I find in the soil (in which the manure has been used) iron compounds present in the ferrous—or not fully oxidised—condition, and it would seem to me likely that these are the result of the liberal use of an organically-acid body such as the peat-moss, and that an unhealthy, imperfectly oxidised condition of the soil has been brought about.

"Very probably if the manure be kept longer and allowed to rot more thoroughly, it becomes more aerated and oxidised, and then would not show the ill effects noticed.

"This, it seems to me, is a possible explanation of what has occurred in the present case, and it is the explanation, at least, which would suggest itself to me."

For the purpose of comparison the following analysis of farmyard manure is taken from the article on Manures in the new edition of the *Encyclopaedia Britannica*, written by Dr. Voelcker. "Farmyard manure consists of the solid and liquid excreta of animals mixed with the material used as litter. Its composition varies according to the conditions under which it is produced. The principal determining factors are: (1) the nature and age of the animals producing it; (2) the food that is given them; (3) the kind and quantity of litter used; (4) whether it be made in feeding boxes, covered yards, or open yards; (5) the length of time and the way in which it has been stored.

"This analysis represents the general composition of well-made farmyard manure in which the litter used is straw :—

Water	75·42
*Organic matter	16·52
Oxide of iron and alumina	·36
Lime	2·28
Magnesia	·14
Potash	·48
Soda	·08
†Phosphoric acid	·44
Sulphuric acid	·12
Chlorine	·02
Carbonic acid, &c.	1·38
Silica	2·76
	100·00 "

* Containing nitrogen = ·59 per cent. which is equal to ammonia ·72 per cent.

† Equal to phosphate of lime ·96.

A use for Orchid Pseudobulbs.—We have received from a correspondent in Grand Cayman, British West Indies, a pseudobulb of *Schomburgkia Thomsoniana* which is used for making tobacco pipes in the island. The pseudobulbs are about 9 inches long and make useful pipe bowls. The plant is known to the natives as "Wild Banana."

In another species (*S. tibicinus*) a native of Honduras, the pseudobulbs are between 1 and 2 feet long and quite hollow and smooth inside, and are commonly used by the native children as trumpets, whence it is called the cowhorn orchid. At their base too there is always a small hole and masses of ants and other insects take advantage of it in constructing their nests.

Botanical Magazine for September.—The plants figured are *Acineta Moorei*, Rolfe (t. 8392); *Viburnum Henryi*, Hemsl. (t. 8393); *Senecio saxifragoides*, Hook. f. (t. 8394); *Clematis chrysocoma*, Franch. (t. 8395) and *Impatiens Herzogii*, K. Schum. (t. 8396).

The *Acineta* is a new species native, as are all the other species of the genus, of South America, but the precise locality whence it was obtained is not recorded. Though closely allied to the rare *A. Hrubyana*, Reichb. f., it is easily distinguished by the flowers being more densely spotted and having distinctly broader lateral lobes to the lip. The material illustrated and described was communicated by Sir F. W. Moore, of the Royal Botanic Gardens, Glasnevin, and was furnished by a plant purchased from Messrs. F. Sander & Sons in 1903.

Viburnum Henryi is a Central Chinese species which has been introduced into cultivation by Messrs. J. Veitch & Sons, who supplied the specimen figured from a plant which flowered in their Coombe Wood nursery. It is characterised by having lanceolate

glabrous leaves, which are glandular on the underside in the axils of the primary veins, and by the pyramidal inflorescence. In September, before its coral-red fruits become black, the plant is highly ornamental.

Senecio saxifragoides is a perennial evergreen herb with nearly orbicular leaves, hoary-woolly beneath, and yellow flower-heads $1\frac{1}{2}$ inch across, arranged corymbosely on scapes up to 1 foot high. The species comes from New Zealand and has been grown at Kew in an unheated frame.

Clematis chrysocoma is a close ally of the familiar *C. montana*, Ham., differing in the coarser and denser indumentum of its shoots. Its sepals are white with a pale pink margin. The Kew plant was a presentation from Mr. M. L. de Vilmorin. The species is Chinese, an attractive garden plant, but unfortunately not hardy at Kew.

Impatiens Herzogii is closely related to *I. Hawkeri*, Bull, from which it is distinguished by being glabrous, and by having vermilion-coloured flowers. It is a native of German New Guinea, and the plant from which the material for the figure was obtained was reared from a cutting sent to Kew by Sir F. W. Moore, who had received seeds from Dr. R. Schlechter.

Presentation to Herbarium.—A small collection of water-colour drawings of British Fungi illustrating the general appearance and habitat of the species pourtrayed has been bequeathed to the Herbarium of the Royal Botanic Gardens, Kew, by the late Miss Charlotte Antonia Sulivan, of Broom House, Fulham, who died in April last.

Ecanda Rubber (*Raphionacme utilis*).—In the *Kew Bulletin*, 1908, p. 209, and 1909, p. 321, a full description is given of this interesting plant, together with other details bearing upon the possibility of its eventually becoming exploited as a source of commercial rubber. From the first it was not doubted that the plant would yield good rubber, but it was pointed out that until trustworthy information could be obtained as to the rate of growth of the rubber-yielding tubers, the cultivation of the plant as a profitable crop could not safely be recommended.

This point has now been cleared up by Mr. Consul Drummond Hay in a recently-issued Diplomatic and Consular Report on the Trade of the Province of Angola for the year 1910, from which the following paragraph is taken.

"Experiments made by Europeans in the regions of Bihé, Bailunda and Ganguellas to cultivate the tuberculous rubber plant known as Bitinga (*Raphionacme utilis*) (*see* the *Kew Bulletin*, 1908, no. v., p. 209) have proved a total failure. To raise the plants in the seed beds was easy enough, but the development of the *tuba* containing the rubber was too slow."

The growth of the seedling plants at Kew has also been found to be remarkably slow.

J. M. H.